Inspection of the Excised Cartilage.

The cartilage is orientated and sketched in the operation record. Old tears are easily recognised. Clean transverse nicks in the edge of the cartilage are almost certainly produced by traction during excision.

Post-Operative Care.

Only one aspect of the subsequent care of the case will be mentioned. There has been a tendency to hasten weight-bearing by allowing the patient up as soon as the fifth day. Most surgeons now consider this too early, and find that post-operative effusions are much less common when weight-bearing is delayed for ten to fourteen days. The longer period allows time for the joint reaction to subside and for a full course of graduated non-weight-bearing exercises.

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Practicalities

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THE TREATMENT OF SOME OF THE CARDIAC DISEASES

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Rest for the patient is one of the oldest forms of treatment of cardiac disease. The cardiac muscle is incapable by itself of rest, and all that one may hope to achieve is a lowering of the patient's metabolic rate, and the removal of all sudden exertions or stresses so that the heart may enjoy a modicum of relaxation. Thus it has been the custom to put a patient who is suffering from severe cardiac failure or an acute affliction of the myocardium to bed on absolute rest, and to keep him there, maybe for months on end, allowing little mental or physical stimulation of any sort. This line of treatment has not been questioned. In the circumstances, is it surprising that most of our cardiac patients become introspective and neurotic in disposition? Is it surprising that when at last they are allowed up they often have multiple symptoms pointing to the heart? Is it surprising that their convalescence is usually prolonged and that a full recovery of function may never be achieved?

How well these questions are answered by a consideration of the symptoms and the mental state of patients who have suffered from a previous rheumatic carditis. Only the other day we saw a young man of twenty-eight, with gross aortic stenosis of rheumatic origin. He refused to consider himself an invalid, playing cricket all the summer, and doing physical exercises during the winter to keep himself fit, as well as doing a full day's work in a war factory. He was annoyed that he, the eldest of four brothers, should have to remain in civilian clothes, and he failed to understand why this was so, since he felt so fit. Compare this with the other common type of patient, who has a lesser lesion, but who complains of a greater multiplicity of symptoms and is functionally, and actively, incapacitated by the past disease process.

Lately, due directly to the influences of this war, a word new to the medical vocabulary has been brought into prominence. That word is "rehabilitation." In its broadest sense "rehabilitation" means the restoration of the subject to a prior healthy mental state, as well as restoring anatomical continuity wherever possible. We know from our study of pathological anatomy that it may be impossible in the present state of our knowledge to reconstruct the architecture of the cardiac valves once they have been smitten by rheumatic disease. That much must we admit; but, handled in the right way, and retaining a correct perspective of the disease processes, how much may we treat, and with great success, the mental processes of the patient, and, to a lesser degree, the physical powers which that patient can regain when given the right circumstances and thorough understanding. Rehabilitation has not, as yet, been directly

applied to cardiology, but if we are to reap some benefit from our present experiences, then we must apply to all branches of medical practice that knowledge which has been found of such great value in the treatment of the mental outlook of patients. Therefore it is imperative to remember that we must treat not only the pathological conditions of the heart but also the mental side of the patient's make up. It will prove of great value in all our treatments if handled with care and tact.

Bearing this aspect of treatment in mind we will now consider the other methods of therapy which are at our disposal.

Following an *acute coronary thrombosis*, the patient is extremely shocked, suffering from severe pain and mental anguish. Once the diagnosis has been made, the injection of morphia or its alkaloids should not be withheld. Morphine sulphate, grain $\frac{1}{4}$, is the most common medication used. It may be necessary to repeat this dose in some cases three to four hours later, but care must be taken not to depress the medullary centres too much. Once the pain has passed off it is necessary to impress upon the patient, quietly but firmly explaining the rationale of this step, that he must rest in bed for some weeks, and in the initial stages he must allow a nurse to do everything for him. In those cases in which dyspnoea is not a marked feature the patient, during the first few days following the acute attack, should be kept lying flat with one small pillow only at the head. As time goes on more pillows may be added so that at the end of a fortnight he is sitting up in bed and beginning to feed himself. But, as has already been stated, the mental side of the patient's make up must not be neglected. Some form of mental relaxation must be enjoined, depending largely upon the tastes of the patient, but he should be guarded against unnecessary worry either about world affairs or personal matters. To some patients, however, deprivation of contact with the outside world or business matters may cause greater mental upset than that caused by a short talk with a trusted and intelligent person.

During the acute stage—that is in the week following thrombosis—he should neither feed nor wash himself, and any other symptoms, such as cough, which are likely to add a strain to the heart, should be treated on general lines. The bowels may be left constipated for the first few days, and after this the giving of some liquid paraffin or other lubricant, followed by a gentle enema, may be all that is required. Purgatives should be withheld.

After the first week the patient should be encouraged to read and to feed himself. Restlessness of mind or body should be combated by the giving of a bromide salt, grains 10 three times a day, or a barbituric acid derivative such as phenobarbitone, grains $\frac{1}{2}$ or grains 1, night and morning. A proprietary preparation of value is Tab. Bellergal, one three times a day or otherwise adjusted to meet the patient's needs. At the end of the second week, providing no other complications have occurred, gentle muscle movements in bed should be encouraged, providing the patient does not suffer from fatigue. The length of stay in bed is dependent upon the severity of the attack, but it should not be shorter than four weeks, and it may, in some cases, be necessary to keep the patient in bed for six to eight weeks or perhaps even longer. Gradually, as the patient is able to move about in bed, he may be permitted to dangle his legs from the bed edge and so obtain freer leg movements. Later he should be allowed to sit up in a chair, at first only for a very short period whilst his bed is made, increasing by, say, half-an-hour to one hour per day. All this time it is important that muscle movements be kept up. Once it has been decided to allow the patient to walk gently around the room, he should be able to do this with far less effort than was expected.

Thus, slowly, the patient returns towards normal; but this slow, steady progress must only be maintained providing no symptoms of cardiac ischaemia or signs of functional cardiac disturbance appear. Once the patient is able to go about his room he should be encouraged to increase his daily performances, but he must be told that a further two to three months convalescence is necessary before he allows himself to return to full activity. He must always be careful when walking up hills, especially if the day is cold, and he should rest for a quarter to half an hour after every meal. It is of great value for him to have a bedroom on the ground floor, if this can be arranged. Smoking should not be allowed for at least six months, and after that only in extreme moderation.

Chronic sclerosis of the coronary arteries leads to the clinical picture of *angina pectoris*. The treatment of this condition lies with the patient, who should be impressed that the pain is brought on by his own exertions; again, especially in this condition, the mental outlook of the patient must be considered and a not too grave prognosis given to him. An initial period

of rest in bed for a few weeks followed by graduated exercises will often prove of great value in treatment. Control of the pain is effected with the nitrite group of drugs. The patient should be given capsules of amyl nitrite to carry about his person, so that in the event of a very acute attack, a capsule is ready to be crushed and the vapour inhaled. Tab. trinitrin grains 1/100 is another useful drug belonging to this series, but it is useless if given empirically three times a day after food. The patient should be instructed that if the pain begins when he is walking, he should immediately stop and chew one of these tablets, and that he should not move, unless in personal danger, until the pain has left him for some minutes. Conversely, if the patient has to go out it may help him to chew a tablet some minutes before leaving the house. Diet may play some part in the treatment of angina pectoris if the patient is of obese build. In such a case reduction of weight, by dietetic measures *only*, will often improve the patient considerably. Thyroid must not be used as an adjunct for this purpose. Sedatives such as the bromides or barbiturates will help to some extent, by lessening the activities of the patient.

As already pointed out, left-sided inframammary pain is an expression of a nervous upset. Enquiry should be made for such a cause, and reassurance given as to the benignity of the symptom. Bromide coupled with valerian is often of the greatest value, especially if given with some barbiturate drug, such as phenobarbitone, grains 1, at night. Graduated exercises and a congenial occupation will often help these patients considerably.

Before discussing the treatment of the cardiac arrhythmias it will be advantageous to consider the pharmacological actions of the two drugs which are of such value in cardiological therapeutics, namely digitalis and quinidine, and to compare their actions.

Digitalis is a cardiac depressant, which affects all parts of the myocardium and the neuromuscular system. Thus it causes the output of stimuli from the sino-auricular node to be decreased, the musculature to be less excitable, and the conduction of the impulses lessened, especially in the auriculo-ventricular bundle. The result of this depressant action, if the drug is given by controlled doses, is that the heart rate is decreased. This causes a longer period of diastole, which allows a longer time for filling of the ventricles to occur; in this way the cardiac output is increased, providing the heart rate is not too greatly slowed. Digitalis is of most value when the gross arrhythmia of auricular fibrillation is present. In this condition the ventricle is bombarded by numerous stimuli from the irregularly-beating auricles, and there is loss of cohesion in the normally well-balanced heart beat, causing a marked decrease in the cardiac output. When the heart is brought under the influence of digitalis the rate of bombardment by auricular stimuli is greatly lessened, and a longer time is allowed for diastolic filling. In this way the cardiac output is increased and the circulation maintained in a more normal manner.

Quinidine is also a cardiac depressant acting directly upon the auricular muscle and depressing the vagus control. Furthermore, it prolongs the refractory period of the cardiac muscle and slows the conduction rate. It will be remembered that both auricular fibrillation and auricular flutter are due to a circus movement occurring around the auricles. For this movement to occur it is necessary to have a stimulus producing a contraction wave which has a certain velocity and to have a certain refractory period of the cardiac muscle. Given a path of the same length the circus movement, once started, can only be stopped either by lengthening the refractory period so that a portion of the muscle is still refractory when the contraction wave reaches it; or by increasing the conduction rate (that is, the velocity) so that part of the muscle is still refractory on arrival of the contraction wave. The effect of quinidine upon the circus movement depends, therefore, upon the preponderance of either increased refractoriness or decreased conduction. If the former prevails, the circus movement stops; but if the latter, the arrhythmia may be further enhanced. The depressant effect of quinidine shows itself also upon the auricular muscle; once the circus movement is abolished there is a decrease in the rate of the heart; or if the arrhythmia is not abolished it causes slowing of the auricular output, often leading to a decrease in the degree of heart block present. This will cause a marked increase of ventricular rate. For example, if the original auricular rate was 300 and a 4 : 1 block was present, the ventricular rate would have been 75. The auricular rate may drop to 250 and the block be halved, i.e. 2 : 1, giving a ventricular rate of 125.

To summarise, the beneficial effects of digitalis are due to a diminution in the number of stimuli passing from auricle to ventricle, producing increased length of diastole; whereas the beneficial effects, if any, of quinidine, are due to the re-establishment of normal rhythm. With both these powerful drugs there is only a small therapeutic range within which we must keep

the patient if we are to achieve good results. Remembering that both these drugs are used because of their depressant action, this is not surprising, and if they are used to obtain maximum benefit there must be only a small margin between the optimal therapeutic effects and the poisonous effects. Furthermore, patients differ in their susceptibility to the noxious action of these drugs. Knowledge of the toxic symptoms is therefore of prime importance before we embark upon therapeutic application.

The first effects of digitalis intoxication are usually manifested by the onset of nausea and vomiting. These two symptoms may be due, however, to venous congestion of the gastric mucosa, which is present in all cases of congestive failure. Thus it is that the additional irritant action of digitalis may cause nausea and vomiting: but when due to this, these symptoms begin soon after the initial administration. In this case it may be necessary to push the digitalis by mouth or to give it rectally; or, better still, intravenously from the beginning of treatment.

Following prolonged administration of large doses of digitalis, nausea and vomiting occur from direct stimulation of the medullary centres and are usually the first signs of intoxication. Digitalis appears to have a constrictor influence upon the renal vessels and with toxic doses a diminishing secretion of urine becomes apparent. The drug may also depress the conductivity of the A.V. bundle, leading to arrhythmia, dropped beats, and heart block. Therefore another sign of intoxication is an apex rate lower than 60, together with the appearance of frequent ectopic extrasystoles, or a pulsus bigeminus, or heart block, all of which may be associated with cyanosis. In some cases, due to hyperexcitability of the cardiac muscle, tachycardia or auricular fibrillation may appear, especially in cases in which digitalis was exhibited with an original normal sinus rhythm. In fact, digitalis can produce any of the arrhythmias if given in toxic, excessive doses. Whenever these symptoms or signs appear the drug must be withheld and recovery will soon take place. In order to allay the possibility of the appearance of these toxic symptoms, digitalis should never be administered more often than six-hourly, since this is the known time for absorption to occur, and one should follow a definite plan of campaign.

The preparations of digitalis of most value in therapeutics are the standard tincture, the dried leaf and the pure glucoside, digoxin. For therapeutic purposes the international unit used is defined as the activity of 0.1 gramme of a standard dried digitalis powder, and is known as the Cat unit. One cat unit corresponds to 1 c.c. (17 minims—N.B. not drops) of the standard tincture, or $1\frac{1}{2}$ grains of the standard dried leaf. In order to obtain a maximum effect upon the heart in a minimum of time in urgent cases, one cat unit should be administered in twenty-four hours for each 10 lbs. of body weight. As an example, if the patient weighs 10 stones, he requires $\frac{14 \times 17}{60}$ drachms (i.e. 4 drachms) within 24 hours, or 21 grains of the powdered leaf in 24 hours.

Since the drug may only be given four times within 24 hours, one must give 1 drachm of the tincture every 6 hours, or 5 grains of digitalis leaf every 6 hours. If full digitalisation has not been induced at the end of 30 hours, half these doses may be given six hourly until this occurs. But one must be ever watching for the early signs of intoxication. Once controlled, no digitalis is administered for one or two days, and then a maintenance dose given. It has been calculated that there must be 5 drachms of the tincture absorbed into the body to produce full digitalisation, and that 15–20 minims are excreted or destroyed each day. Thus the maintenance dose must be just enough to balance this debt.

However, such doses must not be given if digitalis has been administered within the previous ten days, or if the body-weight is unknown. In these cases, if a rapid action is required, three-quarters of the doses suggested above should be given, again at six hourly intervals. If the need for full digitalisation is not so urgent, 20 minims of the tincture or 2 grains of the powdered leaf may be given three times a day, but in this case the full effects will not be seen for about seven days.

Digoxin is a potent glucoside of digitalis which is absorbed and excreted more rapidly than digitalis, and which can be administered either orally or intravenously. But this latter method must only be used when a very rapid effect is required or when the patient vomits everything. It must never be given by this route if the patient has taken digitalis during the previous fortnight. For the average adult weighing 10 stones or over, the initial dose, by mouth, is 1.5 mg. or 1.25–1.0 mg. for patients of lesser build. It is made up into tablets of 0.25 mg. Usually the heart begins to slow about six hours after administration, and then 0.25 mg. (one tablet) is given six hourly until the apex rate is between 60 and 70. Thereafter a maintenance dose of 0.25 mg. once or twice daily is necessary.

If it is desired to give digoxin by the intravenous method, one uses a solution, which is obtainable in ampoules, each containing 0.5 mg. of digoxin in 1 c.c. of 70 per cent alcohol. This solution must be diluted with 9 c.c. of freshly prepared normal saline, and given slowly by intravenous injection, making sure that it is *intravenous*. The initial dose for an adult of 10 stones or over is 0.75–0.1 mg. (i.e. 15–20 c.c. of the prepared solution). The maximum effect is obtained in one or two hours. Thereafter digoxin is given by mouth as directed above.

Quinidine has certain dangers as well as toxic effects. Certain patients have an idiosyncrasy to the drug, and may develop such symptoms as respiratory failure and cerebral paralysis after its administration. Because of its power of restoring normal rhythm, an embolus may be thrown out of an auricle being the seat of auricular fibrillation. Rarely, ventricular fibrillation may supervene. These unfortunate results can be avoided if a test dose be given first (*vide infra*).

Of the toxic effects, headache is nearly always present during quinidine administration, but will disappear when the drug is withheld. The other toxic effects include sweating, tinnitus, nausea and vomiting, abdominal pain, diarrhoea and a scarlatiniform rash. Frequent ectopic ventricular beats, or dimming of vision, are indications for immediate stoppage of administration.

There are certain definite contraindications to the use of quinidine, and they should be noted well.

- i. The drug must not be used if the heart is greatly enlarged.
- ii. If the patient has congestive failure he should be treated with rest, digitalis and diuretics (*vide infra*) until the congestion has disappeared. After this, digitalis is withheld for a week and quinidine therapy may then be begun, if necessary. Quinidine must not be used
- iii. in cases of heart block,

or

- iv. if there is a history of recent embolism.
- v. Its use is inadvisable if the arrhythmia has been present for longer than six months, because of the possibility of embolus formation within the auricles.
- vi. Digitalis and quinidine should not be used simultaneously.

Bearing these dangers and contraindications in mind, we must now consider those cases which will respond well to quinidine therapy. Its greatest value is in cases of auricular fibrillation, especially where there is neither cardiac enlargement nor valvular disease. The best results are obtained in those cases in which the fibrillation has been present for less than six months. This is seen when the fibrillation comes on following acute infections or hyperthyroidism. Quinidine is also of value in cases of paroxysmal fibrillation, i.e. when the fibrillation recurs from time to time. In auricular flutter, quinidine will often cause a resumption of normal rhythm, in many cases without the intermediate stage of fibrillation. If digitalis has been given in cases of auricular flutter and has turned this into fibrillation which persists on withdrawal of the digitalis, quinidine may cause resumption of the normal sinus rhythm. In some cases of paroxysmal tachycardia, quinidine may be of value. It is often given for cases of premature extrasystoles, but the effects are very variable.

Having decided to administer quinidine, the patient should be put to bed on absolute rest for the initial stage of treatment. The drug is administered in a powdered form contained in gelatine capsules, and it is necessary to give a dose of 3 grains on the first day, to discover whether or not the patient has any idiosyncrasy to the drug. If during the next twenty-four hours no toxic symptoms appear, then a full course may be given. The best way to give this full course is to start with 3 grains every two hours for ten doses. On the next day the dose may be increased to 4½ grains every two hours for ten doses, and this may be repeated for two or three subsequent days. If at the end of one week from the start of the treatment, normal sinus rhythm has not been restored, the drug will probably not be of any value. It is essential that the pulse rate be taken by a skilled nurse before each dose is given, and once it has become regular, no further doses should be given. Also, if it is found that the pulse rate has increased above 160 the drug must be discontinued. Patients vary in the amount that is necessary to induce the resumption of normal rhythm, but larger doses than those already stated should not be given, except by the experienced. Once normal rhythm has been restored, it may be necessary to give a small maintenance dose of 3 grains twice a day, to keep the heart under control, although in many cases this is not necessary.

(To be continued)